

accordance with this diagram, and giving each month the same weights as above, we get :—

	Aberration.	Parallax.
Daylight	20 ^{''} 65	+ 0 ^{''} 21
Night	20 ^{''} 36	+ 0 ^{''} 34

It must be borne in mind that the observations of Polaris are peculiarly liable to anything like diurnal periods in the zenith-point corrections.

Note on Diurnal Variations of the nadir and level of the Transit Circle at the Royal Observatory, Greenwich.

(Communicated by the Astronomer Royal.)

Suspicion having been aroused as to the possibility of a variation in nadir of the transit circle depending on the hour of the day, observations of the nadir and level have been made at Greenwich three times a day on all fine days since the middle of 1895—once in the early part of the day, again as soon as observations were commenced in the evening, and finally at the end of the evening's work. These observations have been here arranged in three groups, each extending to six hours, viz. 21^h—3^h, 3^h—9^h, 9^h—15^h (astronomical reckoning), representing roughly the observations made about midday, about sunset, and at the end of the evening's work. Taking the results of the middle group 3^h—9^h as zero, the following table exhibits for each month the corrections to this group (that is, to the nadir observation made about sunset) derived from the observations made about midday and midnight :—

DIURNAL VARIATIONS OF THE NADIR.

Corrections to the observations of the nadir about 6 P.M. deduced from the observations made about midday and midnight.

Month.	1895.			1896.			1897.			1898.			Means.			General Mean.	No. of Obs.
	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"		
Jan.	...	...	...	+ '58 ₂	- '51 ₂	- '17 ₃	- '17 ₃	- '10 ₃	+ '03 ₃	+ '04	- '07	- '02	+ '04	- '07	- '02	20	
Feb.	...	...	...	- '46 ₃	- '31 ₃	- '12 ₄	- '12 ₄	+ '19 ₁	+ '11 ₇	- '08	+ '08	'00	- '08	+ '08	'00	28	
Mar.	...	...	...	+ '13 ₆	+ '01 ₆	+ '32 ₈	+ '32 ₈	+ '38 ₈	- '10 ₄	+ '17	+ '17	+ '17	+ '17	+ '17	+ '17	36	
Apr.	...	...	...	- '05 ₈	+ '15 ₈	+ '24 ₉	+ '24 ₉	+ '31 ₉	+ '03 ₁₁	+ '07	+ '19	+ '13	+ '07	+ '19	+ '13	56	
May	...	...	...	+ '64 ₉	+ '35 ₉	+ '24 ₁₂	+ '24 ₁₂	+ '29 ₁₂	- '04 ₈	+ '29	+ '26	+ '27	+ '29	+ '26	+ '27	58	
June	...	...	...	+ '18 ₁₃	+ '12 ₁₃	+ '15 ₈	+ '15 ₈	+ '05 ₈	+ '21 ₆	+ '18	+ '04	+ '11	+ '18	+ '04	+ '11	54	
July	- '07 ₇	+ '18 ₇	+ '18 ₇	+ '06 ₈	+ '22 ₈	+ '14 ₁₅	+ '14 ₁₅	+ '16 ₁₅	- '10 ₇	+ '04	+ '15	+ '10	+ '04	+ '15	+ '10	74	
Aug.	+ '52 ₁₂	+ '41 ₁₂	+ '41 ₁₂	+ '12 ₉	- '06 ₉	- '20 ₁₃	- '20 ₁₃	- '25 ₁₅	+ '26 ₁₅	+ '16	+ '07	+ '11	+ '16	+ '07	+ '11	102	
Sept.	+ '12 ₁₁	+ '09 ₁₁	+ '09 ₁₁	+ '13 ₆	+ '13 ₆	+ '16 ₇	+ '16 ₇	+ '17 ₇	+ '43 ₁₇	+ '25	+ '13	+ '19	+ '25	+ '13	+ '19	82	
Oct.	+ '19 ₉	+ '26 ₉	+ '26 ₉	+ '35 ₁₀	+ '34 ₁₀	+ '08 ₁₂	+ '08 ₁₂	+ '33 ₁₂	- '03 ₉	+ '15	+ '31	+ '23	+ '15	+ '31	+ '23	80	
Nov.	+ '41 ₉	+ '36 ₉	+ '36 ₉	+ '26 ₇	+ '37 ₇	+ '49 ₄	+ '49 ₄	+ '64 ₄	+ '44 ₈	+ '39	+ '36	+ '37	+ '39	+ '36	+ '37	56	
Dec.	+ '45 ₆	+ '33 ₆	+ '33 ₆	+ '21 ₃	+ '49 ₃	+ '17 ₉	+ '17 ₉	+ '20 ₉	+ '11 ₉	+ '22	+ '15	+ '18	+ '22	+ '15	+ '18	54	
Means	+ '28 ₃₄	+ '27 ₅₄	+ '27 ₅₄	+ '20 ₈₄	+ '16 ₈₄	+ '11 ₁₀₈	+ '11 ₁₀₈	+ '17 ₁₀₈	+ '16 ₁₀₁	+ '17	+ '17	+ '17	+ '17	+ '17	+ '17	700	

An inspection of this table will show that there appears to be a semi-diurnal variation in the nadir, whose amplitude varies in the different months. The groups into which the observations are divided are too long to give very reliable details, but the observations are not sufficiently numerous to warrant smaller subdivisions.

As it is manifestly of interest to see if the observations of level show any similar variations, the level errors have been collected together for those days on which three observations have been made within the times specified, by the arrangement of groups referred to above, and they are here given in an exactly similar form to those of the nadir:---

DIURNAL VARIATIONS OF THE LEVEL ERROR.													
<i>Corrections to the values of the level error found about 6 P.M. from the observations made about midday and midnight.</i>													
Month.	1895.			1896.			1897.			1898.			No of Obs.
	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	21 ^h to 3 ^h .	9 ^h to 15 ^h .	"	
Jan.	...	...	...	...	...	...	...	...	...	...	...	...	20
Feb.	...	...	...	...	...	...	...	...	...	...	...	...	30
Mar.	...	...	...	...	...	...	...	...	...	...	...	...	46
Apr.	...	...	...	...	...	...	...	...	...	...	...	...	58
May	...	...	...	...	...	...	...	...	...	...	...	...	60
June	...	...	...	...	...	...	...	...	...	...	...	...	50
July	...	...	...	...	...	...	...	...	...	...	...	...	68
Aug.	...	...	...	...	...	...	...	...	...	...	...	...	100
Sept.	...	...	...	...	...	...	...	...	...	...	...	...	88
Oct.	...	...	...	...	...	...	...	...	...	...	...	...	84
Nov.	...	...	...	...	...	...	...	...	...	...	...	...	50
Dec.	...	...	...	...	...	...	...	...	...	...	...	...	48
Means	...	...	...	...	...	...	...	...	...	...	...	...	702

This table shows that there is a semi-diurnal variation in the level as well as in the nadir. It would follow from this that stars 6^h apart in right ascension would be liable to give the value of the azimuth error systematically different.

Photographs of Comets, and of the Milky Way. By E. E. Barnard.

I have, at various times, sent a number of photographs of the Milky Way, comets, &c., &c., to the Royal Astronomical Society, but these were not accompanied by any descriptions of the pictures.

It was my intention to describe in detail each one of these pictures to facilitate their study, and to put on record some of the more important features shown on the plates; for various reasons I was unable to do this when sending the pictures. I take the opportunity now, while sending a number of lantern slides from these and other pictures, to partially remedy the omission.

The Royal Astronomical Society has published some reproductions and lantern slides from the star and comet pictures previously sent. The present descriptions will also cover some of these, and for easy reference I shall indicate such pictures by the additional designation, *R.A.S.*, No. —, the number being that given in the “List of Reproductions of Celestial Photographs published by the Royal Astronomical Society” (see page 210). At best, these descriptions will cover only a few of the total lot of pictures sent by me to the R.A.S. at various times.

A few brief remarks of an historical nature may perhaps be important before entering on the descriptions.

While connected with the Lick Observatory, a series of photographs was made of all the different portions of the Milky Way which were visible from that latitude. This work was begun in the spring of 1889. The instrument employed, as is well known, was a 6-inch portrait lens of 31 inches focus, which bore the name of Willard, and the date 1859, and for this reason I have called it the “Willard lens” in all my work. This lens was used in the early days of wet plate photography for portrait work in a San Francisco photograph gallery. In the early times it was necessary to use a large aperture to lessen the duration of exposure in taking portraits; but after the invention of the quick dry plates, such a large lens became unnecessary, and this one was discarded for smaller and more convenient lenses.

Upon experimenting with this large lens, I found, on account of its wide field and great light-grasping power, that it was specially suited for the photography of the Milky Way, comets, &c. It was attached to a wooden camera box, and was first used by strapping it to the tube of the 6-inch equatorial. Latterly it was placed on an ordinary equatorial mounting, which did not permit continuous exposures to be carried across the meridian.

Besides the pictures of the Milky Way and nebulae, a number of photographs were secured of Swift's Comet of 1892, Holmes's